Wheat without aphids?

Amma Simon

&

Gia Aradottir

Department for Environment Food & Rural Affairs

Wheat Genetic Improver Network

Introduction

ROTHAMSTED RESEARCH

Bird-cherry oat aphid
(*Rhopalosiphum padi*)

English grain aphid
(*Sitobion avenae*)

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Introduction

ROTHAMSTED RESEARCH

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ROTHAMSTED RESEARCH

Post-alighting (antibiosis) resistance: when the aphid is on the plant, the plants morphology/biochemistry reduces aphid development, reproduction and/or survival.

Pre-alighting (antixenosis) resistance: affects aphid behaviour usually as a non-preference response.

Post-alighting resistance

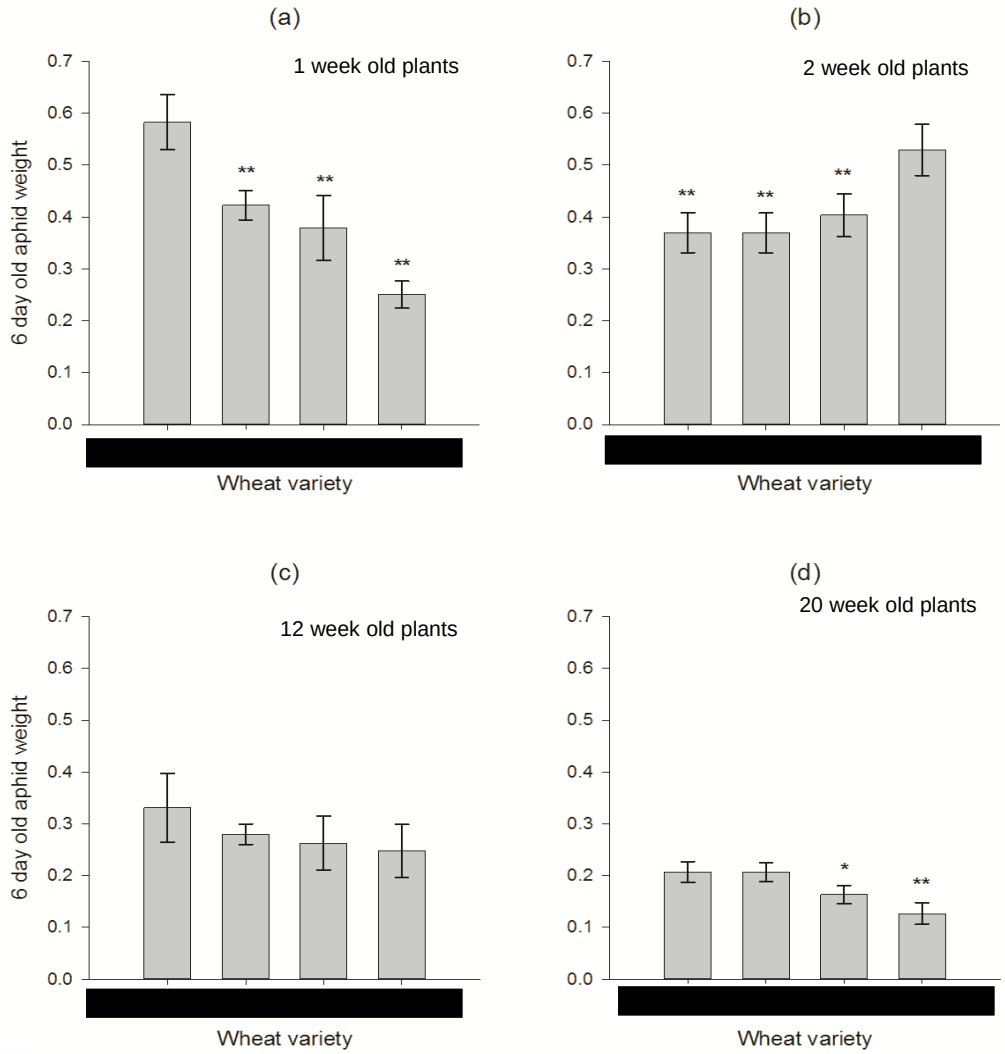
ROTHAMSTED RESEARCH

Determine whether post-alighting resistance seen in 7 day old *T. monococcum* is present in older wheat.

*R. padi d*evelopment and reproductive success on 1, 2, 12 and 20 week old wheat.

Nymph development

ROTHAMSTED RESEARCH



R. padi

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Aphid reproductive success

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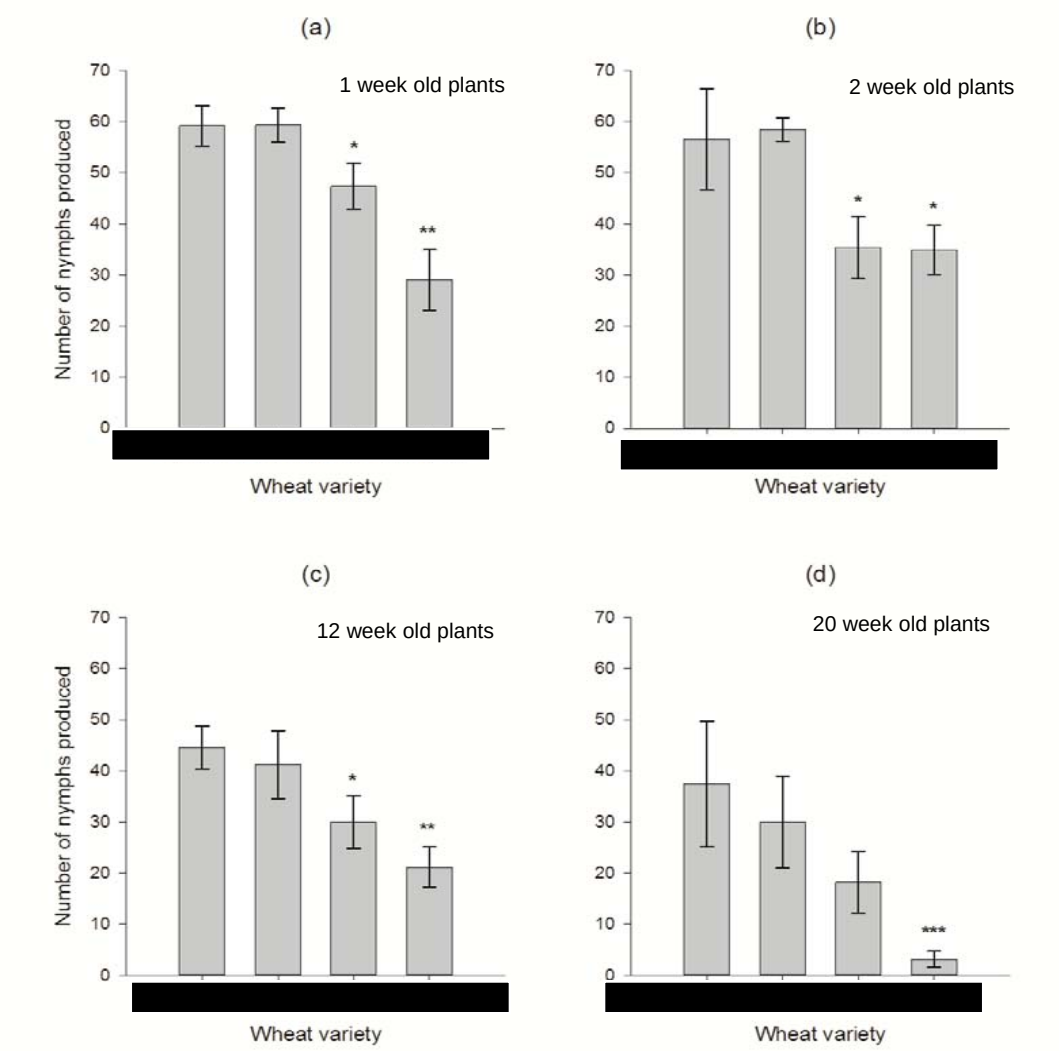

R. padi

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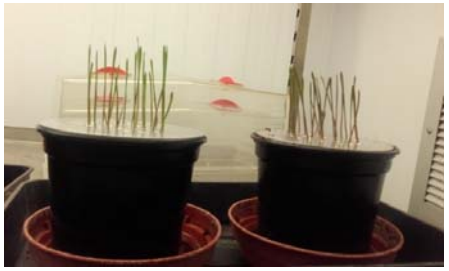
Pre-alighting resistance

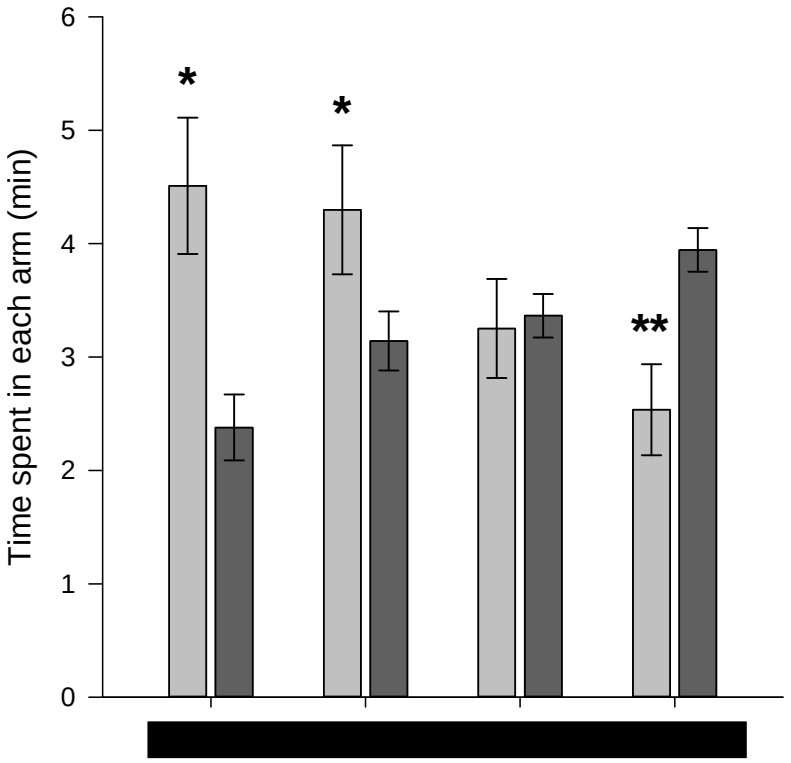
ROTHAMSTED RESEARCH

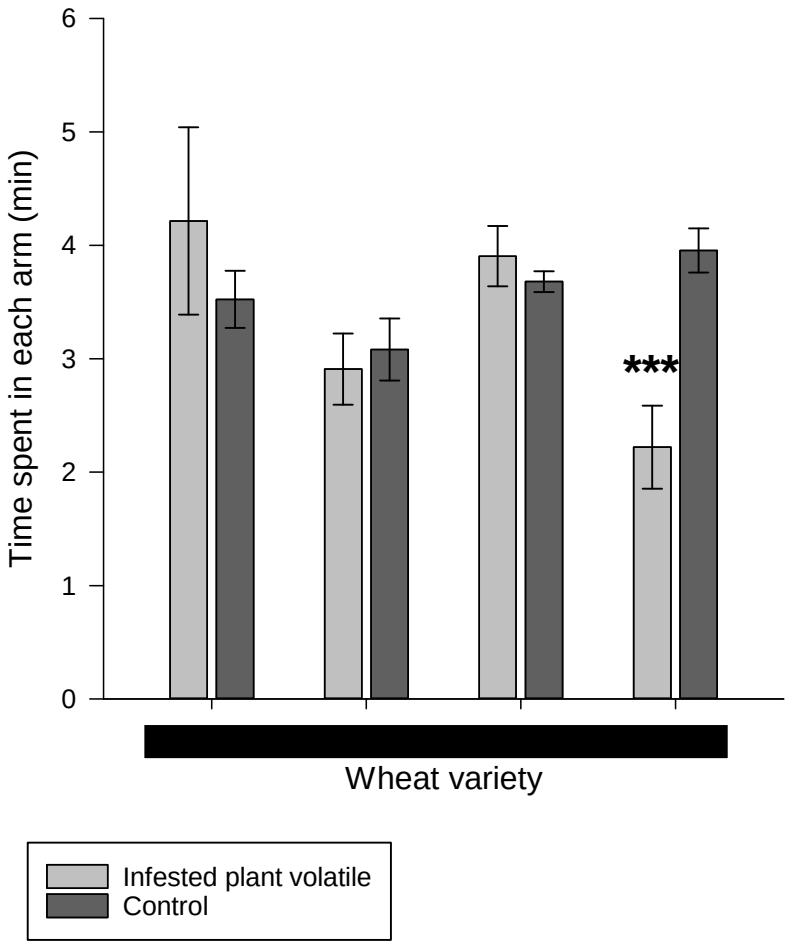
- Determine if MDR045 and MDR049 confers pre-alighting resistance towards *R. padi*
- Determine whether there is any difference the volatiles emitted from *R. padi* infested and un-infested wheat across all varieties and if this affects *R. padi* attraction/repulsion



Pre-alighting results

ROTHAMSTED RESEARCH





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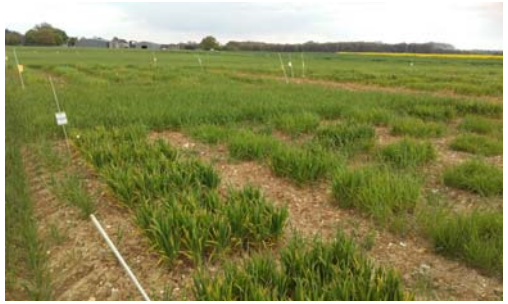
Field

ROTHAMSTED RESEARCH

Determine whether resistance observed in the lab is present in field conditions





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Field results - aphids

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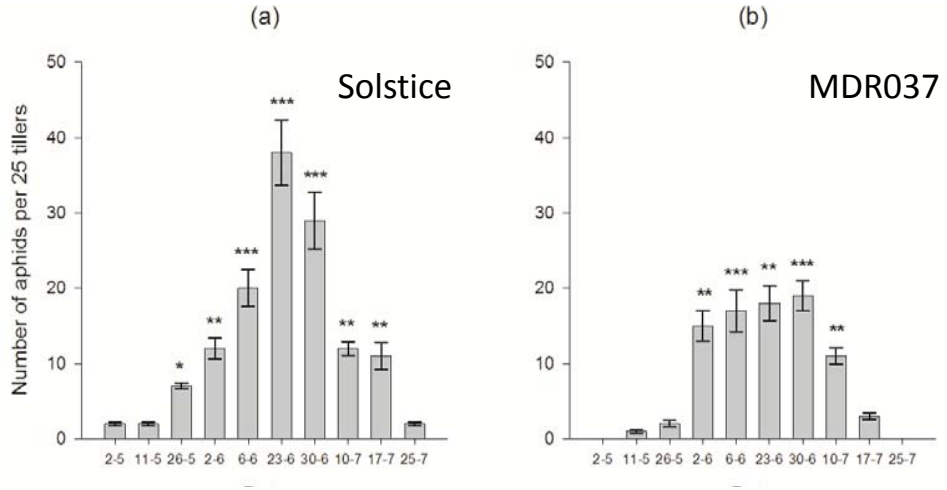
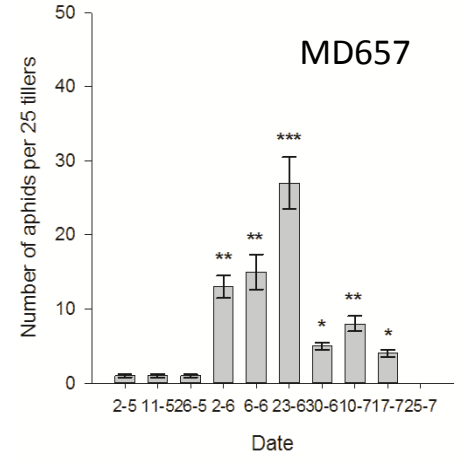
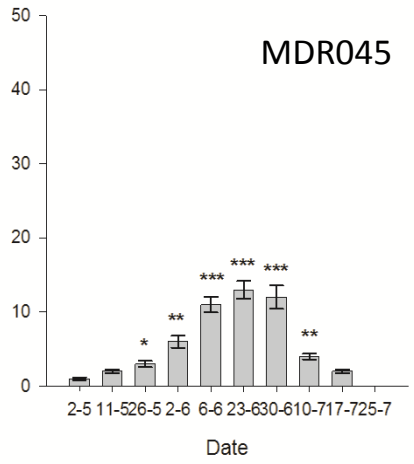
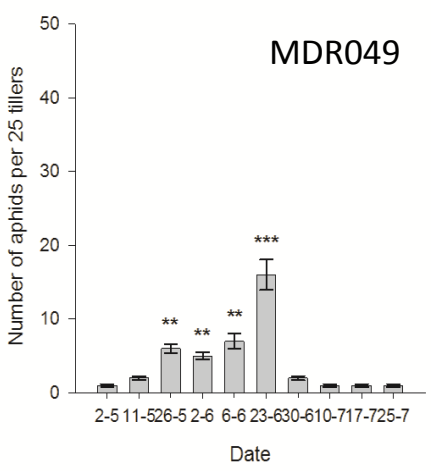




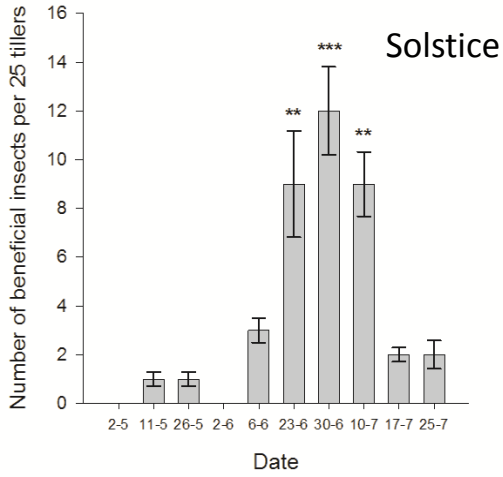




Field results – beneficial insects

ROTHAMSTED RESEARCH

(a)



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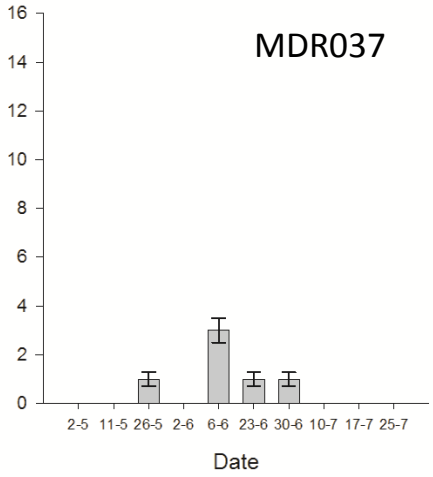
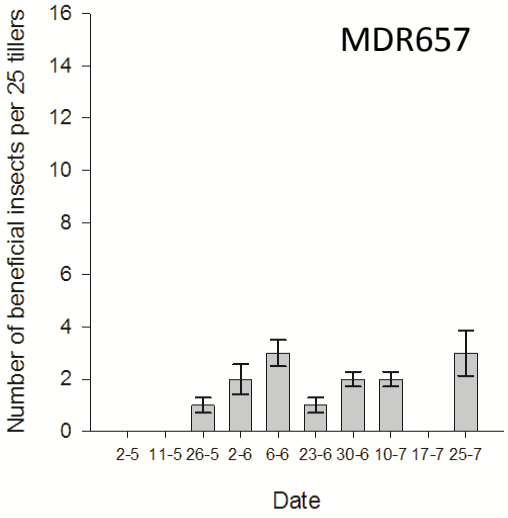


(e)

(c)



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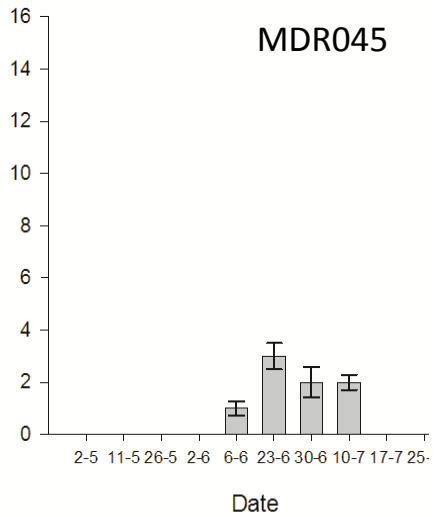
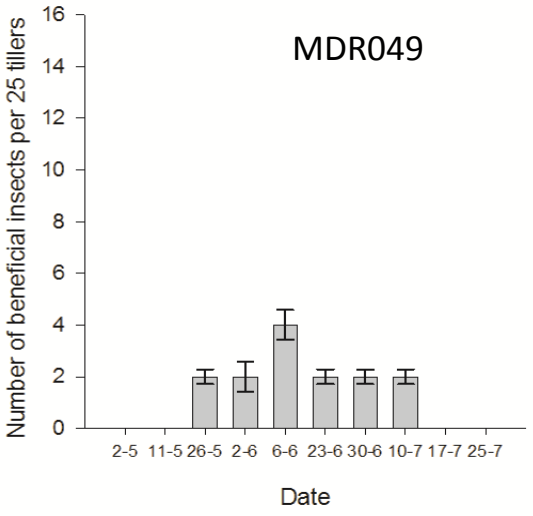
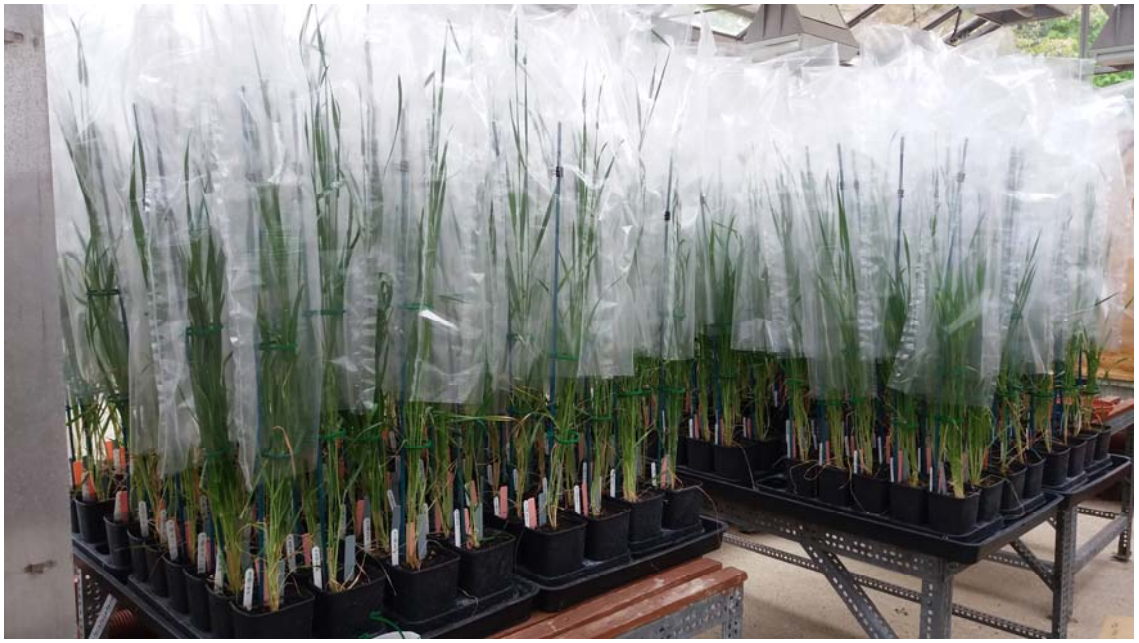




Mapping populations

ROTHAMSTED RESEARCH



Crosses

MDR037 x MDR045
MDR037 x MDR049
MDR037 x MDR657

F1, F2 and F3 generations of these crosses have now been tested in the phenotyping screen against both aphid species.

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S. avenae

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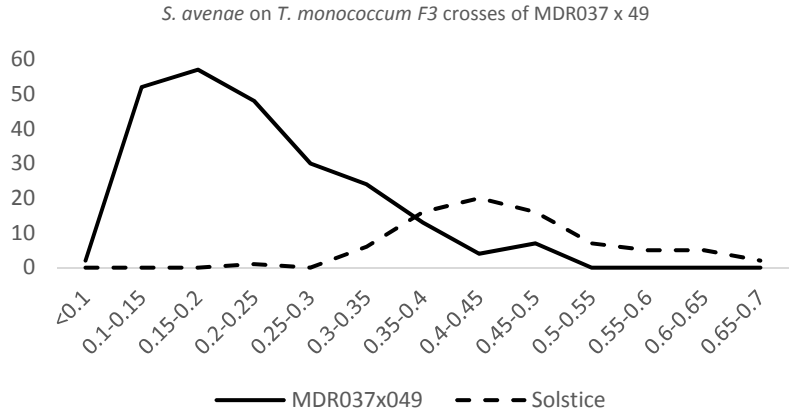

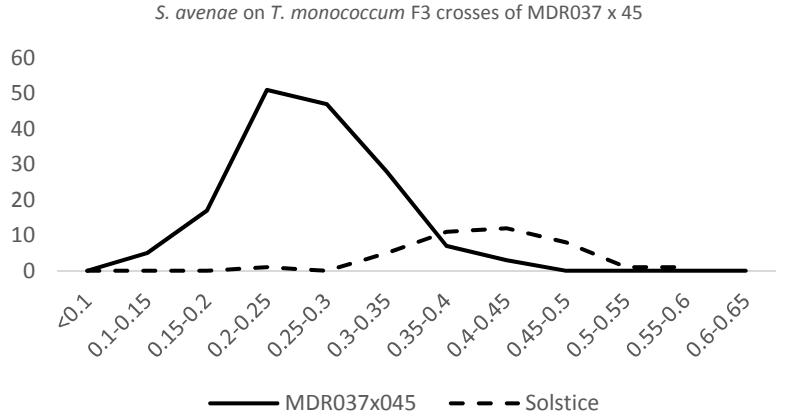

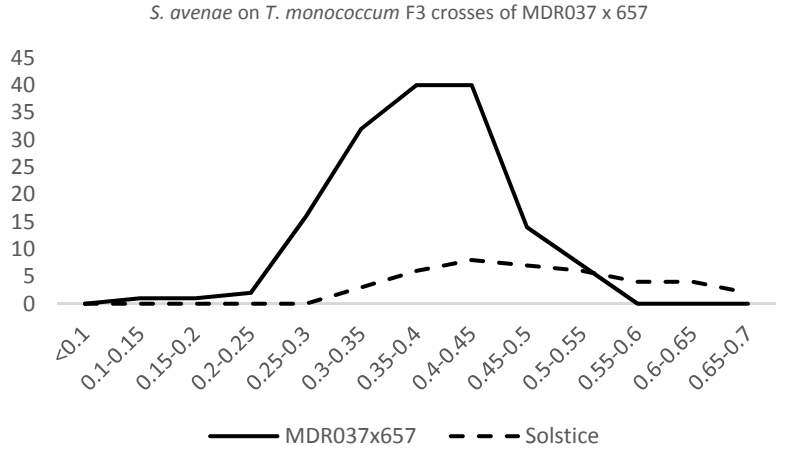

R. padi

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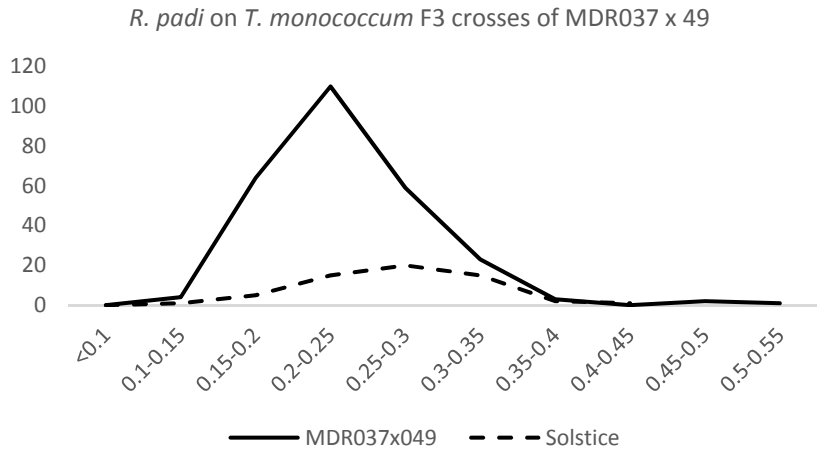
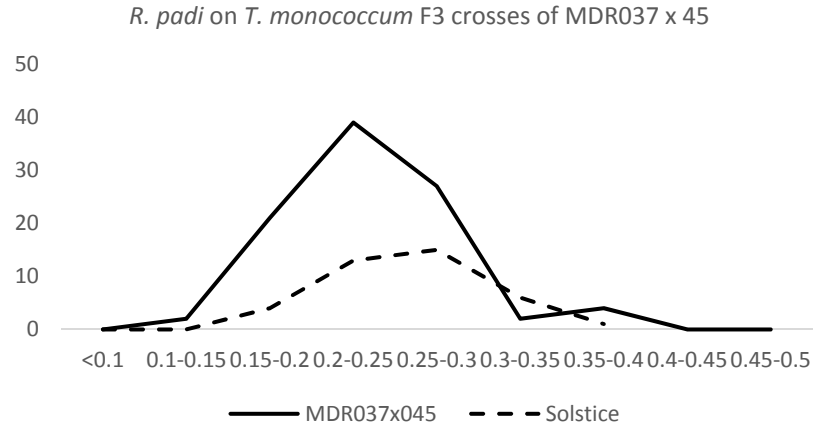
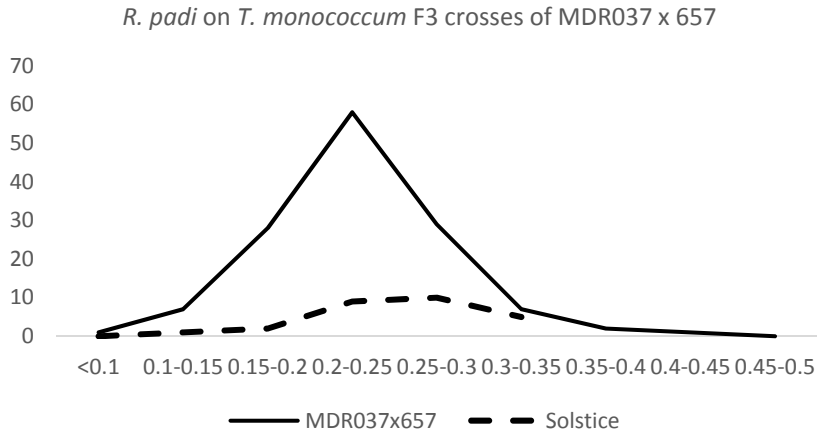
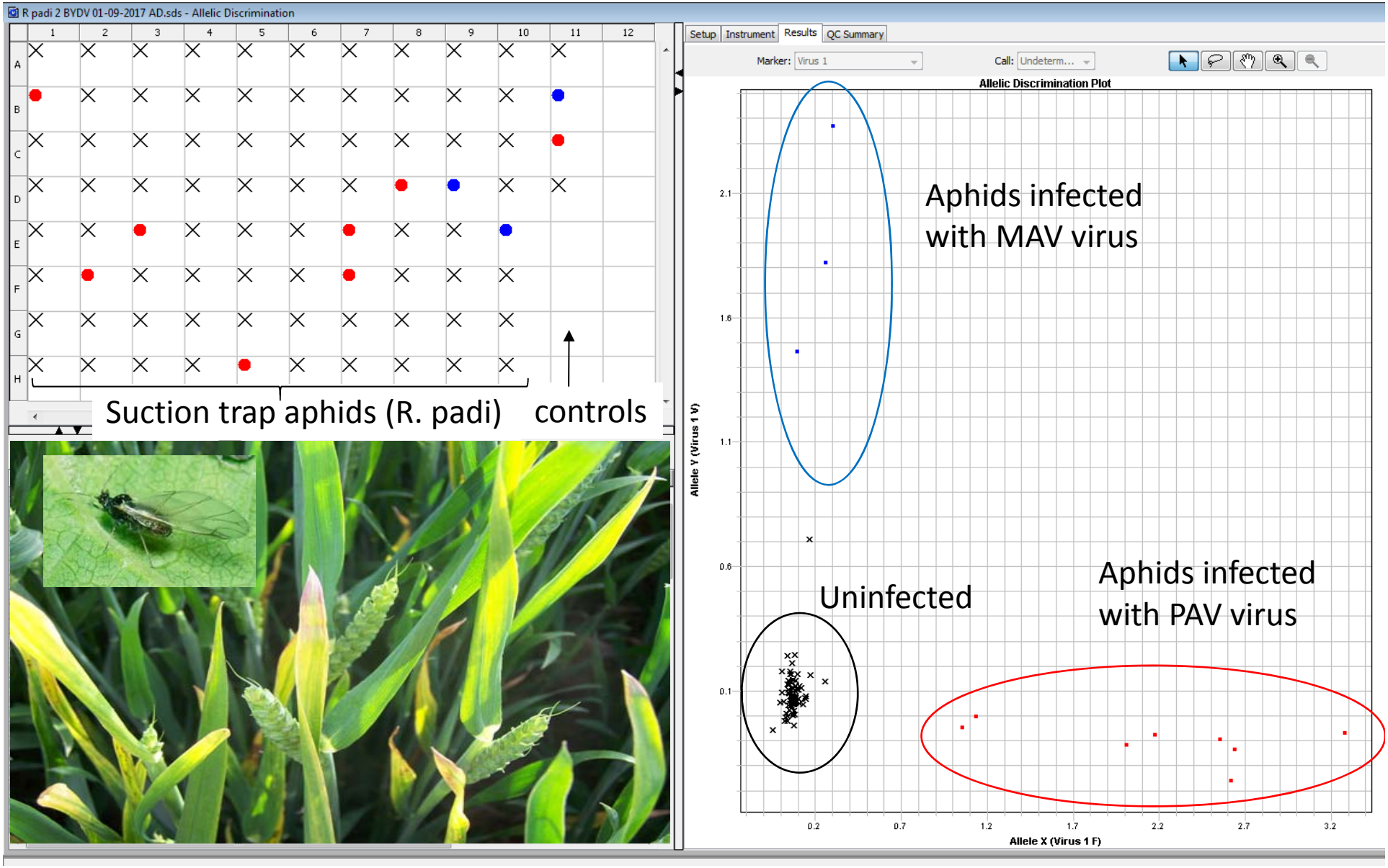






A real-time PCR assay for detecting BYDV in cereal aphids

ROTHAMSTED RESEARCH



The main vectors of BYDV in cereals are female bird-cherry oat aphids and English grain aphids

AHDB Aphid News

17th November 2017

This news sheet summarises up-to-date results from the Rothamsted/SASA **suction-trap (ST) network**. Included on the Bird cherry–oat aphid (*Rhopalosiphum padi*) table this week are numbers accumulated from a start date (18/09) representing the **early emergence** of cereal seedlings and giving an indication of the build-up of virus vector pressure.

During bulletin week 6th November – 12th November the total number of bulletin aphids caught has decreased substantially to less than a third of that of the last bulletin week. Bird cherry–oat aphid numbers have likewise generally fallen in ST sites across the country with all sites catching less than 100 across the week and are for the most part in line with the 10-year mean. The numbers accumulated from an early emergence date are presenting a mixed picture of the build-up of virus vector pressure with some sites possibly being at a higher risk than on average (see table). Testing at Rothamsted this week has shown that the proportion of aphids of the cereal colonising form has increased to 54% from 33% last week (though it should be reiterated that low numbers were caught for this test). Average temperatures this bulletin week have continued to fall below the aphid flight threshold further reducing the opportunity for aphid migration. Aphids that have located unprotected crops will continue to do well at temperatures above 3°C.

WINTER CEREALS

The main aphid vectors of **BYDV** are females of the **bird cherry–oat aphid**, *Rhopalosiphum padi* and the **English grain aphid**, *Sitobion avenae*.

'*' indicates where totals have been corrected proportionally to seven days, fewer days' samples having been processed.

Sitobion avenae					*Rhopalosiphum padi* - females only				
Compared to last week	2017	2016	10-year average 2007-16	06/11-12/11	Compared to last week	2017	10-year average 2007-16	2017 Acc from 18/09	2007-2016 Acc from 18/09
	0	0	0	Dundee		0	2	1136	1341
	0	0	0	Gogarbank (Edinburgh)	↓	1	2	4060	2675
	*0	0	0	Newcastle		*0	5	1536	2351
	0	0	/	York	↓	3	/	5937	/
	0	0	0	Preston	↓	77	62	4704	9654
	0	0	0	Kirton	↓	11	14	3221	2263
↓	0	0	0	Broom's Barn (Bury St Edmunds)	↓	8	6	2964	1691
	*0	0	1	Wellesbourne	↓	*5	7	3196	1618
	0	0	0	Hereford	↓	13	10	1646	2526
	*0	0	0	Rothamsted (Harpenden)		*0	8	461	1069
	0	0	0	Writtle	↓	11	11	4002	1970
	*0	0	0	Silwood Park (nr Ascot)	↓	*0	7	813	940
	0	0	0	Wye	↓	6	12	2360	1816
	0	0	0	Starcross (nr Exeter)	↓	26	11	1537	1555

- The numbers of bird cherry–oat aphid (*Rhopalosiphum padi*) decreased at eleven ST sites this week. The highest number recorded was from the ST at Preston (77).

ROTHAMSTED RESEARCH

Suction-Traps 2017

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SASA

El - Elgin	D - Dundee	G - Gogarbank	Ay - Ayr
N - Newcastle	P - Preston	Y - York	K - Kirton
BB - Broom's Barn	We - Wellesbourne	H - Hereford	RT - Rothamsted Tower
Wr - Writtle	SP - Silwood Park	W - Wye	SX - Starcross

Conclusions

ROTHAMSTED RESEARCH

- Resistance in *T. monococcum* based on both pre- and post- alighting effects
- Lower aphid infestation in field conditions
- Mapping populations under development for QTL mapping of traits
- Would like to include tests of BYDV prevalence in aphid populations and include screens for BYDV resilience in wheat lines tested in future work.

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Acknowledgements

Rothamsted Research

- Lesley Smart
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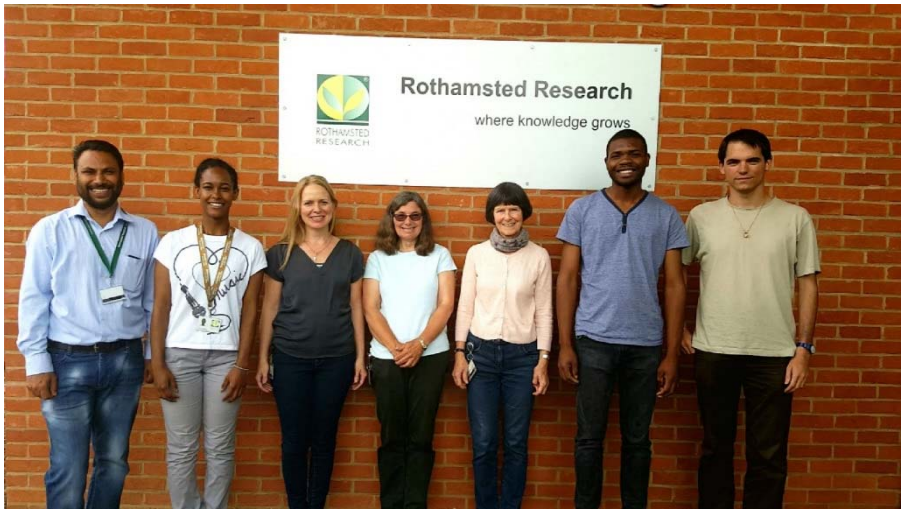
- Mike Hammond-Kosack
- Designing Future Wheat team
- Pest-host interactions group
- Rothamsted farm

University of Nottingham

- John Foulkes



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